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Annual Fish Passage Report - Rock Island Dam Columbia River, Washington, 1965

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and

John H. Broughton

SPECIAL SCIENTIFIC REPORT–FISHERIES No. 533

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

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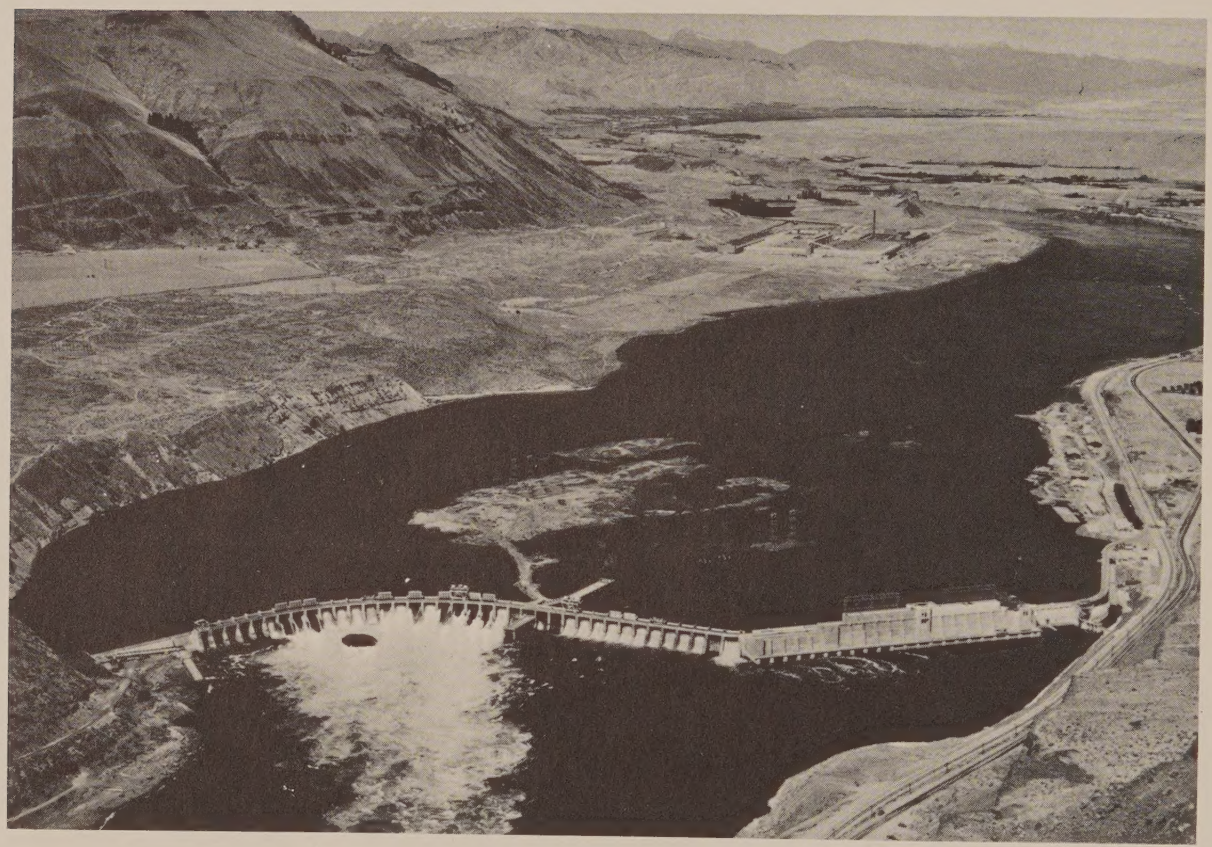

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By

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ABSTRACT

Fish were again counted through the fishways at Rock Island Dam, thus providing counts at this location of the 33d consecutive year. Chinook and sockeye counts were down, and coho and steelhead counts were up from 1964. The counts of chinook, coho, and steelhead were larger, and the count of sockeye smaller than their respective averages for 1933-64. The count of salmon and steelhead was exceeded by the count of other species.

Four and one-half percent of the salmon and steelhead passing through the counting gates had injuries.

Daily maximum and minimum water temperatures and daily average rate of stream flow were recorded.

INTRODUCTION

Rock Island Dam, located on the Columbia River about 12 miles downstream from Wenatchee, Wash., has been in operation since 1933, and is owned and operated by Chelan County Public Utility District No. 1.

This report on passage of fish at Rock Island during 1965 provides information on the operation of fishways and the numbers of fish using them.

Rock Island Dam has three fishways: one located on the right bank, another on the left bank, and the third about the center of the dam. The bank fish ladders began operating in 1933, and the middle ladder in 1936. All three ladders have been modified since then.

Fish ascending Rock Island Dam ladders have been counted annually since 1933, the longest continuous record of Columbia River fish counts.

Included in this report are comments covering various fishery investigations at Rock Island Dam during 1965.

COUNTING PROCEDURES

Fish counting in 1965 began on May 1 and ended October 15. From May 1 through August 31, fish were counted 16 hr. (hours) each day, starting at 5 a.m. and ending at 9 p.m. From September 1 through October 15, counting was reduced to 14 hr. each day, starting at 6 a.m. and ending at 8 p.m. to conform to available daylight.

Fish counters were allowed a 15-min. (minute) rest period at the end of each hour. During all periods of noncounting, the gate at the counting station was closed, and upstream movement of fish was stopped at this point.

A water glass, floated on the surface over each counting board, eliminated sun glare and water surface disturbances and thus permitted clear observation of each fish.

COUNTING OF FISH

All species of fish using the fishways at Rock Island Dam are identified and recorded. Because of their greater importance, the different species of salmon and the steelhead passing the dam are discussed separately.

Chinook, Oncorhynchus tshawytscha

The 1965 chinook count of 36,407 (jacks included) was more than twice the average of 18,061 for the 32-yr. (year) period 1933-64 and was about 72 percent of the record count of 50,713 in 1957 (table 1). Monthly totals of chinook given in table 2 show a peak movement of these fish in July. Maximum day's count of chinook (jacks excluded) was 500 on August 5 (table 3), as compared to 896 on May 5, 1964. Of the chinook (jacks excluded), about 75

Table 1.--Annual counts and periods of counting of salmon and steelhead trout at Rock Island Dam, 1933-65 1/

Year	Chinook Salmon	Sockeye salmon	Coho salmon	Steelhead trout	Total	Period of count
	Number	Number	Number	Number	Number	
1933	5,668	40,737	182	1,055	47,642	7/21- 9/23
1934	7,115	2,227	69	583	9,994	7/31-12/31
1935	16,305	14,013	11	5,418	35,747	1/1 -11/15
1936	7,290	16,500	0	2,373	26,163	5/5 - 9/29
1937	5,133	15,089	58	2,214	22,494	5/11-10/16
1938	5,795	17,095	78	2,399	25,367	4/12-10/29
1939	11,206	19,591	13	5,425	36,235	5/1 -12/9
1940	9,512	27,093	2	5,220	41,827	3/5 -12/10
1941	2,507	963	28	3,513	7,011	4/1 -12/8
1942	6,833	16,340	1	3,693	26,867	4/10-11/30
1943	11,129	17,522	15	2,315	30,981	4/5 -11/30
1944	3,364	5,035	186	1,338	9,923	4/12-11/17
1945	5,699	7,148	166	1,118	14,131	4/4 -12/17
1946	9,981	45,030	32	1,779	56,822	1/4 -11/5
1947	11,717	79,831	229	1,971	93,748	1/1 -11/27
1948	7,083	84,184	29	2,360	93,656	1/1 -11/16
1949	12,353	18,600	40	2,470	33,463	1/1 -11/15
1950	10,348	50,134	72	1,852	62,406	1/1 -11/23
1951	18,752	101,826	8	3,121	123,707	1/1 -11/18
1952	20,121	114,349	27	2,883	137,380	1/1 -11/18
1953	31,080	151,747	40	4,001	186,868	1/1 -12/31
1954	33,283	91,234	44	5,406	129,967	1/1 -12/31
1955	25,658	155,055	39	3,141	183,893	5/1 - 9/30
1956	25,085	92,443	29	1,540	119,097	5/1 - 9/29
1957	50,713	71,261	27	3,927	125,928	5/1 - 9/28
1958	32,457	98,695	60	3,970	135,182	5/1 - 9/30
1959	23,352	72,351	118	4,138	99,959	5/4 - 9/30
1960	26,550	60,341	94	6,226	93,211	5/2 -10/29
1961	33,067	19,233	50	7,042	59,392	5/1 -10/27
1962	34,154	29,253	737	7,591	71,735	5/1 -10/27
1963	34,688	64,768	20	7,078	106,554	5/1 -10/30
1964	39,951	69,411	61	5,016	114,439	5/1 -10/24
1965	36,407	42,379	258	6,063	85,107	5/1 -10/15

1/ Counts are now considered to be the official record of fish passing Rock Island Dam.

Table 2.--Monthly number of salmon and steelhead counted at Rock Island Dam, 1965

Species	May	June	July	August	Sept.	Oct. [1]	Total
	Number	Number	Number	Number	Number	Number	Number
Chinook	2,184	1,364	8,236	5,819	1,510	181	19,294
Chinook (jacks)	682	1,161	2,848	4,357	7,234	831	17,113
Sockeye	0	24	34,684	7,334	311	26	42,379
Coho	0	0	0	7	132	119	258
Steelhead . . .	322	31	289	1,970	2,204	1,247	6,063
Total	3,188	2,580	46,057	19,487	11,391	2,404	85,107

[1] October 1-15.

percent ascended the left ladder, while 16 and 9 percent ascended the middle and right ladders, respectively (table 4). In 1964, percentages of chinook (jacks excluded) which used the left, middle, and rights ladders were about 51, 28, and 21, respectively.

Table 3.--Maximum daily counts, salmon and steelhead, Rock Island Dam, 1965

Species	Date	Fish
		Number
Chinook (except jacks)	Aug. 5	500
Chinook (jacks). . . .	Sept. 14	557
Sockeye.	July 16	2,863
Coho	Sept. 29 & Oct. 7	27
Steelhead.	Oct. 7	187

Table 4.--Semimonthly number and percent of chinook salmon counted over each fish ladder, Rock Island Dam, 1965

(Jacks not included)

Dates	Left ladder		Middle ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	Number
May 1-15	153	28.0	350	64.1	43	7.9	546
16-31	836	51.0	514	31.4	288	17.6	1,638
June 1-15	564	68.3	153	18.5	109	13.2	826
16-30	348	64.7	130	24.2	60	11.1	538
July 1-15	2,996	78.3	381	10.0	449	11.7	3,826
16-31	3,471	78.7	598	13.6	341	7.7	4,410
Aug. 1-15	3,779	79.8	803	16.9	155	3.3	4,737
16-31	916	84.7	102	9.4	64	5.9	1,082
Sept. 1-15	710	83.3	51	6.0	91	10.7	852
16-30	510	77.5	62	9.4	86	13.1	658
Oct. 1-15	140	77.3	13	7.2	28	15.5	181
Totals	14,423	74.7	3,157	16.4	1,714	8.9	19,294

Chinook Jacks

Some chinook return from the ocean as mature fish in the year following their seaward migration and are referred to as "jacks." These fish are small, and males predominate. At Rock Island Dam in 1965, all chinook 22 in. (inches) or less in length were counted as jacks. Each counting board has a marked section, 22 in. long, for use of the counter in gaging the length of these small chinook. The maximum daily count of 557 jacks occurred on September 14 (table 3), 2 days later than in 1964. The 17,113 fish recorded as jacks constituted about 47 percent of the total chinook run as compared to about 36 percent in 1964. In 1965, about 81, 10, and 9 percent of the jacks used the left, middle, and right ladders, respectively (table 5), as compared to about 74, 14, and 12 percent in 1964. Monthly totals are given in table 2.

Table 5.--Semimonthly number and percent of chinook salmon jacks counted over each fish ladder, Rock Island Dam, 1965

Dates	Left ladder		Middle ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	Number
May 1-15	35	44.9	36	46.1	7	9.0	78
16-31	422	69.9	110	18.2	72	11.9	604
June 1-15	579	69.3	122	14.6	134	16.1	835
16-30	228	69.9	44	13.5	54	16.6	326
July 1-15	877	74.9	136	11.6	158	13.5	1,171
16-31	1,370	81.7	160	9.5	147	8.8	1,677
Aug. 1-15	1,826	83.4	245	11.2	118	5.4	2,189
16-31	1,834	84.6	224	10.3	110	5.1	2,168
Sept. 1-15	3,660	86.1	301	7.1	291	6.8	4,252
16-30	2,348	78.7	261	8.8	373	12.5	2,982
Oct. 1-15	620	74.6	79	9.5	132	15.9	831
Totals	13,799	80.7	1,718	10.0	1,596	9.3	17,113

Sockeye, Oncorhynchus nerka (Blueback or Red)

The sockeye count of 42,379 was about 81 percent of the 32-yr. average of 52,159 (table 1) and less than the 1964 run by 27,032 fish. Peak of the run was reached on July 16, when 2,863 fish were counted through the fishways. Peak daily count in 1964 occurred on July 27 when 6,247 fish were recorded.

Of the sockeye passing Rock Island Dam in 1965, about 69 percent ascended the left ladder, while 18 and 13 percent ascended the middle and right ladders, respectively (table 6). Percentage distribution of sockeye through left, middle, and right fishways in 1964 was about 66, 15, and 19, respectively.

Data pertaining to sockeye daily counts are in tables 9-14. Monthly totals of sockeye counted in 1965 (table 2) show 82 percent of

Table 6.--Semimonthly number and percent of sockeye salmon counted over each ladder, Rock Island Dam, 1965

Dates	Left ladder		Middle ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	Number
May 1-15	0	0	0	0	0	0	0
16-31	0	0	0	0	0	0	0
June 1-15	0	0	0	0	0	0	0
16-30	22	91.6	1	4.2	1	4.2	24
July 1-15	5,338	66.8	1,004	12.6	1,651	20.6	7,993
16-31	19,228	72.0	3,859	14.5	3,604	13.5	26,691
Aug. 1-15	3,724	57.2	2,384	36.6	407	6.2	6,515
16-31	574	70.1	183	22.3	62	7.6	819
Sept. 1-15	170	67.5	47	18.6	35	13.9	252
16-30	45	76.3	4	6.8	10	16.9	59
Oct. 1-15	18	69.2	4	15.4	4	15.4	26
Totals	29,119	68.7	7,486	17.7	5,774	13.6	42,379

the total run passed through the fishways in July, as compared to about 79 percent during the same month in 1964.

Coho, Oncorhynchus kisutch (Silver)

The 1965 coho count of 258 was more than three times the 32-yr. average of 80, and about 35 percent of the peak year of 737 in 1962 (table 1). The first coho was observed on August 17, 1965, as compared to September 11 in 1964. Maximum day's count of 27 occurred on September 29 and October 7. Of the coho passing the dam in 1965, about 84 percent used the left ladder, while 3 and 13 percent used the middle and right ladders, respectively (table 7). In 1964, approximate percent use by ladder was left, 80; middle, 2; and right, 18. Additional data are shown in tables 2, 12-14.

Table 7.--Semimonthly number and percent of coho salmon counted over each ladder, Rock Island Dam, 1965

Dates	Left ladder		Middle ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	Number
May 1-15	0	0	0	0	0	0	0
16-31	0	0	0	0	0	0	0
June 1-15	0	0	0	0	0	0	0
16-30	0	0	0	0	0	0	0
July 1-15	0	0	0	0	0	0	0
16-31	0	0	0	0	0	0	0
Aug. 1-15	0	0	0	0	0	0	0
16-31	4	57.1	1	14.3	2	28.6	7
Sept. 1-15	8	100.0	0	0	0	0	8
16-30	104	83.9	3	2.4	17	13.7	124
Oct. 1-15	100	84.0	4	3.4	15	12.6	119
Totals	216	83.7	8	3.1	34	13.2	258

Steelhead, Salmo gairdneri

The 1965 steelhead count of 6,063 was 73 percent greater than the 32-yr. average of 3,506. In 1965, greatest number of steelhead passed through the fishways in September when 2,204 were recorded (table 2). Peak monthly movement of these fish in 1964 also occurred in September when 1,688 were counted.

Of the steelhead passing Rock Island Dam in 1965, about 83 percent used the left ladder, while 7 and 10 percent ascended the middle and right ladders, respectively (table 8). In 1964, approximate percent use by ladder was: left, 76; middle, 10; and right, 14. Maximum day's count in 1965 was 187 on October 7 (table 3), as compared to 129 on September 17, 1964. Additional data pertaining to the movement of steelhead at Rock Island Dam are contained in tables 9-14.

Table 8.--Semimonthly number and percent of steelhead trout counted over each ladder, Rock Island Dam, 1965

Dates	Left ladder		Middle ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	Number
May 1-15	95	48.7	38	19.5	62	31.8	195
16-31	56	44.1	22	17.3	49	38.6	127
June 1-15	14	66.7	2	9.5	5	23.8	21
16-30	10	100.0	0	0	0	0	10
July 1-15	24	72.7	3	9.1	6	18.2	33
16-31	195	76.2	22	8.6	39	15.2	256
Aug. 1-15	940	87.2	79	7.3	59	5.5	1,078
16-31	775	86.9	32	3.6	85	9.5	892
Sept. 1-15	630	83.3	44	5.8	82	10.9	756
16-30	1,272	87.9	70	4.8	106	7.3	1,448
Oct. 1-15	995	79.8	116	9.3	136	10.9	1,247
Totals	5,006	82.6	428	7.0	629	10.4	6,063

Table 9.--Daily air and water temperatures, stream flows, and fish counts, Rock Island Dam, May 1965

Date	Air temperatures[1] Max.	Air temperatures[1] Min.	Water temperatures[2] Max.	Water temperatures[2] Min.	Stream flow	Chinook	Sockeye	Coho	Steelhead	Total
	°F.	°F.	°F.	°F.	c.f.s.	Number	Number	Number	Number	Number
May 1	63	41	45	44	154,800	55	0	0	6	61
2	65	43	45	45	243,000	32	0	0	20	52
3	63	44	45	44	232,400	33	0	0	4	37
4	60	46	46	45	237,400	6	0	0	7	13
5	63	41	46	45	225,000	36	0	0	16	52
6	72	38	46	45	241,400	34	0	0	14	48
7	75	43	46	46	230,600	36	0	0	6	42
8	82	58	47	46	200,800	62	0	0	18	80
9	83	58	48	47	214,600	32	0	0	10	42
10	85	61	48	47	220,400	24	0	0	21	45
11	86	56	49	48	207,200	29	0	0	14	43
12	80	60	49	48	214,800	45	0	0	18	63
13	79	58	49	48	237,800	43	0	0	16	59
14	78	53	49	48	230,900	67	0	0	13	80
15	72	58	49	48	234,400	90	0	0	12	102
16	62	53	49	48	234,100	117	0	0	14	131
17	70	42	49	48	234,600	77	0	0	11	88
18	70	42	49	48	235,900	116	0	0	11	127
19	70	50	49	48	244,000	174	0	0	17	191
20	66	44	49	48	246,600	142	0	0	17	159
21	70	46	49	48	243,800	84	0	0	7	91
22	64	50	50	49	237,200	167	0	0	5	172
23	70	56	50	48	233,100	144	0	0	7	151
24	76	54	50	49	232,300	128	0	0	7	135
25	86	48	50	49	235,700	179	0	0	3	182
26	82	56	51	49	229,500	218	0	0	10	228
27	86	59	51	50	229,400	178	0	0	1	179
28	90	59	52	51	256,000	147	0	0	6	153
29	82	61	52	51	278,500	116	0	0	10	126
30	78	46	52	50	289,900	115	0	0	0	115
31	78	43	52	50	291,600	140	0	0	1	141

1/ Air temperatures were taken with maximum and minimum thermometer.
2/ Water temperatures were taken with a thermograph located in the middle ladder.

Table 10.--Daily air and water temperatures, stream flows, and fish counts, Rock Island Dam, June 1965

Date	Air temperatures[1] Max.	Air temperatures[1] Min.	Water temperatures[2] Max.	Water temperatures[2] Min.	Stream flow	Chinook	Sockeye	Coho	Steelhead	Total
	°F.	°F.	°F.	°F.	c.f.s.	Number	Number	Number	Number	Number
June 1	82	52	52	51	297,500	168	0	0	4	172
2	90	59	52	51	300,200	156	0	0	7	163
3	85	62	53	51	302,800	150	0	0	2	152
4	87	60	54	52	305,700	200	0	0	1	201
5	90	62	53	52	302,400	126	0	0	1	127
6	91	65	54	52	311,400	127	0	0	1	128
7	83	59	54	53	308,400	129	0	0	0	129
8	87	59	55	53	310,300	92	0	0	0	92
9	93	65	55	53	297,200	75	0	0	3	78
10	94	62	56	54	314,600	86	0	0	0	86
11	70	62	55	54	322,500	84	0	0	0	84
12	74	55	55	54	318,300	80	0	0	0	80
13	80	58	55	54	301,100	63	0	0	1	64
14	76	56	55	54	299,000	51	0	0	0	51
15	65	52	55	54	288,600	74	0	0	1	75
16	85	54	56	54	300,300	42	0	0	0	42
17	68	58	55	55	321,800	43	0	0	1	44
18	83	60	56	55	349,900	60	0	0	0	60
19	82	62	57	55	333,600	68	2	0	0	70
20	82	61	57	56	332,300	59	0	0	1	60
21	84	59	57	56	334,500	50	2	0	1	53
22	82	59	58	56	330,900	36	0	0	3	39
23	90	60	58	56	330,600	36	1	0	1	38
24	80	62	58	56	328,800	47	0	0	1	48
25	82	61	58	56	317,300	53	0	0	1	54
26	75	56	58	56	307,000	63	0	0	1	64
27	81	54	58	56	300,400	74	2	0	0	76
28	83	58	58	56	286,400	88	2	0	0	90
29	83	57	58	56	278,500	67	7	0	0	74
30	88	58	58	56	272,600	78	8	0	0	86

1/ Air temperatures were taken with maximum and minimum thermometer.

2/ Water temperatures were taken with a thermograph located in the middle ladder.

Table 11.--Daily air and water temperatures, stream flows, and fish counts, Rock Island Dam, July 1965

Date	Air temperatures[1] Max. °F.	Air temperatures[1] Min. °F.	Water temperatures[2] Max. °F.	Water temperatures[2] Min. °F.	Stream flow c.f.s.	Chinook Number	Sockeye Number	Coho Number	Steelhead Number	Total Number
July 1	98	60	58	56	261,500	138	15	0	0	153
2	93	65	58	57	254,300	146	29	0	1	176
3	90	67	58	57	259,200	149	30	0	1	180
4	96	60	59	57	252,500	220	29	0	0	249
5	98	67	59	58	254,800	173	27	0	2	202
6	98	68	60	59	235,400	295	47	0	2	344
7	98	77	60	59	252,000	281	106	0	0	387
8	82	63	60	59	250,900	408	148	0	1	557
9	80	60	60	59	258,800	343	249	0	1	593
10	78	60	59	58	253,200	442	403	0	1	846
11	86	60	59	57	244,300	436	707	0	4	1,147
12	84	58	60	58	248,700	577	1,037	0	6	1,620
13	88	62	60	59	243,400	626	1,765	0	5	2,396
14	98	62	60	58	251,100	332	1,488	0	6	1,826
15	95	68	60	59	231,900	431	1,913	0	3	2,347
16	98	68	61	60	226,400	470	2,863	0	7	3,340
17	96	69	61	60	216,500	506	2,312	0	13	2,831
18	84	62	60	59	208,200	419	2,122	0	10	2,551
19	86	60	60	59	187,500	424	2,088	0	11	2,523
20	62	60	60	60	191,200	332	2,008	0	7	2,347
21	74	56	59	59	188,800	393	1,765	0	18	2,176
22	84	57	60	58	199,400	440	1,505	0	9	1,954
23	87	60	61	59	200,300	362	1,888	0	18	2,268
24	96	62	61	60	199,900	377	1,557	0	13	1,947
25	96	65	62	61	190,300	262	1,504	0	16	1,782
26	96	74	62	61	191,400	339	1,493	0	18	1,850
27	96	68	63	62	168,500	309	971	0	26	1,306
28	102	68	63	62	156,500	324	1,076	0	11	1,411
29	102	68	64	62	131,600	482	1,278	0	24	1,784
30	103	68	63	61	130,300	317	1,047	0	34	1,398
31	104	69	63	61	127,300	331	1,214	0	21	1,566

1/ Air temperatures were taken with maximum and minimum thermometer.

2/ Water temperatures were taken with a thermograph located in the middle ladder.

Table 12.--Daily air and water temperatures, stream flows, and fish counts, Rock Island Dam, August 1965

Date	Air temperatures[1] Max. °F.	Air temperatures[1] Min. °F.	Water temperatures[2] Max. °F.	Water temperatures[2] Min. °F.	Stream flow c.f.s.	Chinook Number	Sockeye Number	Coho Number	Steelhead Number	Total Number
Aug. 1	108	72	63	62	126,900	460	1,050	0	27	1,537
2	81	79	64	63	129,700	640	1,119	0	72	1,831
3	88	71	65	64	133,000	569	623	0	56	1,248
4	88	68	65	64	154,400	548	821	0	75	1,444
5	92	66	65	63	137,100	702	640	0	92	1,434
6	94	61	65	63	140,300	575	465	0	70	1,110
7	102	67	65	64	139,800	420	364	0	75	859
8	96	71	65	64	137,300	585	298	0	75	958
9	96	69	65	64	142,300	544	226	0	70	840
10	95	73	65	64	147,100	541	207	0	82	830
11	90	68	65	64	150,100	363	206	0	106	675
12	80	70	66	65	152,700	334	125	0	73	532
13	83	60	65	64	164,100	175	147	0	71	393
14	90	59	64	63	128,200	249	117	0	84	450
15	90	64	64	62	111,500	221	107	0	50	378
16	97	63	64	63	126,200	280	63	0	86	429
17	92	65	64	63	147,700	190	95	1	60	346
18	100	71	65	63	145,300	169	60	0	48	277
19	84	71	64	64	133,500	207	58	2	93	360
20	82	67	65	64	113,300	206	87	2	66	361
21	91	62	65	64	127,300	191	54	0	58	303
22	74	62	64	64	121,900	102	113	0	55	270
23	73	63	64	63	122,400	139	35	0	55	229
24	82	60	65	64	123,900	225	14	0	39	278
25	76	60	64	64	110,800	281	58	0	49	388
26	86	61	65	63	128,100	278	19	0	41	338
27	76	60	64	63	124,300	247	36	0	64	347
28	72	54	64	63	115,500	165	27	0	56	248
29	76	54	64	62	119,500	120	72	0	41	233
30	80	49	64	62	107,700	213	15	0	42	270
31	82	52	64	63	121,400	237	13	2	39	291

1/ Air temperatures were taken with maximum and minimum thermometer.

2/ Water temperatures were taken with a thermograph located in the middle ladder.

Table 13.--Daily air and water temperatures, stream flows, and fish counts, Rock Island Dam, September 1965

Date	Air temperatures[1] Max. °F.	Air temperatures[1] Min. °F.	Water temperatures[2] Max. °F.	Water temperatures[2] Min. °F.	Stream flow c.f.s.	Chinook Number	Sockeye Number	Coho Number	Steelhead Number	Total Number
Sept. 1	88	49	65	63	113,300	409	12	2	52	475
2	80	60	65	63	100,100	298	28	2	41	369
3	78	56	65	63	104,200	215	32	0	28	275
4	73	53	65	63	92,400	252	27	1	34	314
5	80	60	64	63	89,400	197	26	2	35	260
6	82	51	65	63	91,400	189	12	0	33	234
7	80	54	66	64	89,100	338	26	0	34	398
8	86	60	65	64	86,400	321	15	0	35	371
9	80	59	65	64	72,300	255	21	0	46	322
10	80	58	66	64	68,500	299	10	0	55	364
11	80	57	66	64	76,500	432	13	0	52	497
12	80	54	66	64	40,800	443	12	0	63	518
13	78	58	65	64	79,200	369	10	0	50	429
14	78	54	66	64	79,800	640	5	0	104	749
15	60	60	65	63	86,600	447	3	1	94	545
16	62	48	64	63	85,700	236	6	2	69	313
17	62	42	64	63	70,500	325	4	2	64	395
18	76	45	64	62	53,100	292	5	3	75	375
19	74	45	63	62	47,400	351	4	2	52	409
20	75	42	63	62	72,900	297	5	1	35	338
21	82	64	62	61	79,300	264	5	1	75	345
22	80	57	63	61	77,600	239	1	2	54	296
23	76	51	63	61	73,400	379	2	6	116	503
24	80	50	63	62	67,100	273	1	3	132	409
25	80	53	63	62	68,500	199	11	10	113	333
26	70	53	63	61	53,200	171	4	16	121	312
27	70	49	63	61	74,900	224	3	11	122	360
28	70	48	63	61	66,700	154	1	25	181	361
29	74	58	62	61	70,100	126	5	27	144	302
30	74	53	62	61	48,700	110	2	13	95	220

1/ Air temperatures were taken with maximum and minimum thermometer.

2/ Water temperatures were taken with a thermograph located in the middle ladder.

Table 14.--Daily air and water temperatures, stream flows, and fish counts, Rock Island Dam, October 1965

Date	Air temperatures[1] Max.	Air temperatures[1] Min.	Water temperatures[2] Max.	Water temperatures[2] Min.	Stream flow	Chinook	Sockeye	Coho	Steelhead	Total
	°F.	°F.	°F.	°F.	c.f.s.	Number	Number	Number	Number	Number
Oct. 1	82	50	62	61	51,100	82	1	9	50	142
2	78	52	62	61	40,000	96	6	3	90	195
3	82	52	62	60	36,700	96	3	6	118	223
4	68	60	62	61	52,400	118	2	6	103	229
5	70	50	62	61	41,400	89	2	1	66	158
6	76	63	62	60	53,400	83	2	12	100	197
7	69	50	62	60	50,600	69	1	27	187	284
8	80	50	61	60	49,200	77	0	5	114	196
9	74	57	61	59	37,500	37	1	3	82	123
10	72	44	60	59	45,500	54	3	8	86	151
11	70	43	60	58	76,800	50	3	13	40	106
12	63	48	60	59	59,400	54	1	6	57	118
13	68	48	60	59	45,600	33	0	3	64	100
14	62	51	60	58	45,600	35	1	5	59	100
15	60	41	60	59	43,600	39	0	12	31	82

1/ Air temperatures were taken with maximum and minimum thermometer.
2/ Water temperatures were taken with a thermograph located in the middle ladder.

Other Species of Fish

In 1965, species of fish passing Rock Island Dam other than salmon and steelhead were counted as in former years (tables 15-20). No claims are made as to complete accuracy of identification of these fish; however, the degree of accuracy is consistent with that maintained at other dams on the Columbia River. Such data should only be used as a rough index of abundance of these fish.

In 1965, 115,045 fish other than salmon and steelhead passed Rock Island Dam. This number, as compared to 118,284 in 1964, exceeded the count of salmon and steelhead by about 30,000. The species included are largescale sucker, Catostomus macrocheilus; longnose sucker, Catostomus catostomus; squawfish, Ptychocheilus oregonense; Rocky Mountain whitefish, Prosopium williamsoni; Columbia River chub, Mylocheilus caurinus; carp, Cyprinus carpio; lamprey, Entosphenus tridentatus; Dolly Varden trout, Salvelinus malma; and rainbow trout, Salmo gairdneri.

Table 15.--Other species of fish counted, Rock Island Dam, May 1965

Date	Sucker	Squawfish	Whitefish	Chub	Carp	Lamprey	Dolly Varden	Rainbow trout	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number
May 1	11	0	6	2	0	0	0	0	19
2	26	1	10	0	0	0	0	0	37
3	51	0	21	0	0	0	0	2	74
4	27	0	9	0	0	0	0	1	37
5	13	5	11	0	0	0	0	0	29
6	67	34	29	0	0	0	0	2	132
7	131	38	17	0	0	0	0	0	186
8	112	51	17	1	0	0	0	4	185
9	137	20	46	2	0	0	0	1	206
10	192	44	23	1	0	0	0	2	262
11	203	60	30	1	0	0	0	3	297
12	225	48	10	5	0	0	0	1	289
13	335	22	16	0	0	0	0	0	373
14	92	17	11	0	0	0	0	0	120
15	33	20	13	2	0	0	0	0	68
16	10	4	4	0	0	0	0	0	18
17	18	4	4	0	0	0	0	0	26
18	11	12	4	0	0	0	1	0	28
19	26	23	13	2	0	0	1	2	67
20	12	16	12	0	0	0	0	1	41
21	15	12	12	1	0	0	0	1	41
22	68	19	4	4	0	0	0	1	96
23	97	36	5	2	0	0	0	0	140
24	116	26	13	2	0	0	0	0	157
25	190	26	5	7	0	0	0	1	229
26	517	180	15	25	0	0	0	1	738
27	440	207	16	15	0	0	0	0	678
28	961	213	129	88	0	0	0	0	1,391
29	758	199	20	51	0	0	0	0	1,028
30	190	26	15	4	0	0	0	0	235
31	70	14	3	1	0	0	0	0	88
Total	5,154	1,377	543	216	0	0	2	23	7,315

Table 16.--Other species of fish counted, Rock Island Dam, June 1965

Date	Sucker	Squawfish	Whitefish	Chub	Carp	Lamprey	Dolly Varden	Rainbow trout	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number
June 1	63	9	0	1	0	0	0	0	73
2	144	56	5	3	0	0	0	0	208
3	221	102	4	10	0	0	0	0	337
4	351	81	35	25	0	0	0	2	494
5	419	112	16	46	0	0	0	1	594
6	403	149	20	11	0	0	0	3	586
7	231	73	5	8	0	0	0	1	318
8	260	99	1	14	0	0	1	1	376
9	450	208	5	47	0	0	0	1	711
10	1,253	713	15	138	0	0	0	0	2,119
11	968	237	33	69	0	0	0	2	1,309
12	245	72	9	17	0	0	0	0	343
13	91	40	3	12	0	0	0	0	146
14	146	76	4	20	0	0	0	0	246
15	153	50	2	6	0	0	0	1	212
16	508	156	6	47	0	1	0	0	718
17	1,419	218	10	51	0	0	0	3	1,701
18	1,061	158	15	35	0	1	0	0	1,270
19	505	239	2	65	0	2	0	0	813
20	526	262	4	47	0	2	0	1	842
21	367	254	5	73	0	3	0	0	702
22	786	369	2	117	0	2	0	1	1,277
23	1,641	534	6	113	0	1	0	0	2,295
24	1,737	650	14	130	1	1	0	0	2,533
25	1,232	402	52	125	1	1	0	0	1,813
26	1,025	284	11	33	0	0	0	0	1,353
27	623	162	15	29	3	0	0	0	832
28	778	159	1	29	0	0	1	3	971
29	1,054	269	7	42	0	1	0	2	1,375
30	1,049	601	7	105	0	1	0	0	1,763
Total	19,709	6,794	314	1,468	5	16	2	22	28,330

Table 17.--Other species of fish counted, Rock Island Dam, July 1965

Date	Sucker	Squawfish	Whitefish	Chub	Carp	Lamprey	Dolly Varden	Rainbow trout	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number
July 1	2,071	1,075	8	114	0	0	0	0	3,268
2	1,832	878	35	136	0	3	0	0	2,884
3	2,053	743	15	169	1	2	0	1	2,984
4	397	297	13	88	0	0	0	0	795
5	716	296	5	50	2	1	1	0	1,071
6	835	479	7	36	0	0	0	0	1,357
7	1,988	971	3	101	3	1	0	0	3,067
8	1,715	773	6	123	5	4	3	2	2,631
9	412	148	10	33	3	0	2	0	608
10	231	113	4	11	1	0	0	0	360
11	262	97	5	7	0	0	0	0	371
12	437	154	5	12	2	1	0	1	612
13	857	292	6	33	0	1	1	0	1,190
14	1,413	326	2	18	2	0	3	0	1,764
15	860	350	8	43	1	2	0	0	1,264
16	932	364	14	130	1	1	0	0	1,442
17	745	447	5	61	9	0	1	0	1,268
18	295	147	2	21	3	0	1	0	469
19	192	68	8	15	0	1	3	2	289
20	656	134	6	3	4	0	1	1	805
21	149	37	12	5	0	0	0	1	204
22	184	155	7	7	5	0	1	1	360
23	472	263	18	31	1	1	0	0	786
24	502	259	4	19	4	5	1	1	795
25	663	501	15	63	5	2	0	0	1,249
26	935	973	6	81	8	3	0	2	2,008
27	1,038	1,092	2	125	4	1	1	3	2,266
28	178	237	10	28	2	5	0	0	460
29	161	212	10	8	5	0	0	3	399
30	179	143	14	5	6	0	0	3	350
31	488	146	1	1	8	1	2	2	649
Total	23,848	12,170	266	1,577	85	35	21	23	38,025

Table 18.--Other species of fish counted, Rock Island Dam, August 1965

Date	Sucker	Squawfish	Whitefish	Chub	Carp	Lamprey	Bull trout	Rainbow trout	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number
Aug. 1	518	172	4	29	5	2	0	1	731
2	596	626	23	60	12	5	3	2	1,327
3	640	813	20	129	16	3	2	4	1,627
4	2,153	1,009	6	138	22	9	0	1	3,338
5	524	366	11	49	33	20	2	2	1,009
6	324	138	12	22	18	9	3	2	528
7	804	282	17	6	11	16	1	2	1,139
8	519	168	15	31	13	33	0	0	779
9	548	149	6	24	9	40	0	1	777
10	532	270	8	80	5	39	1	2	937
11	405	160	23	48	2	24	0	0	662
12	414	193	18	40	10	20	2	4	735
13	517	76	22	19	14	70	0	1	719
14	259	41	14	3	6	45	1	4	373
15	129	26	11	7	4	41	0	1	219
16	188	93	15	19	4	86	0	0	405
17	597	113	15	24	6	122	0	1	878
18	290	74	24	23	4	225	0	3	643
19	282	114	24	30	7	276	0	3	736
20	380	147	14	24	7	151	0	1	724
21	631	131	16	19	12	127	0	1	937
22	355	46	14	7	7	276	1	0	706
23	609	118	27	21	1	91	0	4	871
24	418	64	14	8	3	159	0	3	669
25	256	64	14	3	6	146	0	0	489
26	390	107	15	14	3	118	0	0	647
27	235	58	21	16	9	188	0	1	528
28	284	52	12	14	1	100	0	2	465
29	275	41	8	19	2	153	0	0	498
30	147	43	5	21	4	126	0	0	346
31	224	73	9	11	3	101	0	1	422
Total	14,443	5,829	457	958	261	2,853	16	47	24,864

Table 19.--Other species of fish counted, Rock Island Dam, September 1965

Date	Sucker	Squawfish	Whitefish	Chub	Carp	Lamprey	Dolly Varden	Rainbow trout	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number
Sept. 1	995	97	14	17	9	112	0	1	1,245
2	411	85	15	17	1	124	0	0	653
3	256	58	16	19	1	122	0	7	479
4	261	57	18	19	2	67	0	3	427
5	327	77	21	16	4	73	0	0	518
6	793	105	21	18	7	45	0	2	991
7	290	92	26	46	3	78	0	1	536
8	305	72	46	62	5	88	0	1	579
9	373	69	57	37	2	19	0	0	557
10	335	115	42	46	2	22	1	5	568
11	535	87	34	46	5	43	0	0	750
12	345	120	53	55	2	81	0	0	656
13	234	103	35	35	2	67	0	1	477
14	217	107	40	35	2	57	0	1	459
15	138	76	41	52	3	15	1	0	326
16	102	27	58	25	4	4	0	0	220
17	87	39	61	9	3	9	0	0	208
18	81	27	62	20	0	3	0	2	195
19	159	46	59	10	2	8	0	3	287
20	138	28	59	16	0	20	0	1	262
21	91	40	48	17	2	10	0	0	208
22	86	53	102	7	1	105	0	0	354
23	47	35	95	14	5	50	0	0	246
24	100	41	111	4	2	41	0	4	303
25	180	50	73	6	0	21	0	2	332
26	172	47	52	9	1	52	0	2	335
27	59	24	47	5	5	41	1	0	182
28	47	19	72	6	2	13	0	1	160
29	36	13	112	7	2	8	0	0	178
30	68	21	120	3	1	4	1		218
Total	7,268	1,830	1,610	678	80	1,402	4	37	12,909

Table 20.--Other species of fish counted, Rock Island Dam, October 1965

Date	Sucker	Squawfish	Whitefish	Chub	Carp	Lamprey	Dolly Varden	Rainbow trout	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number
Oct. 1	69	20	70	5	0	4	1	1	170
2	223	44	103	9	1	8	0	0	388
3	305	52	104	9	3	13	0	0	486
4	165	25	85	19	0	33	0	0	327
5	47	31	97	18	3	21	0	2	219
6	31	21	97	8	2	15	0	2	176
7	33	11	107	1	0	20	0	0	172
8	41	20	152	0	0	4	0	0	217
9	68	15	76	5	1	9	0	0	174
10	76	18	97	1	0	13	0	0	205
11	17	10	181	1	0	11	0	0	220
12	21	26	218	1	2	7	0	0	275
13	39	5	130	2	0	3	0	1	180
14	76	17	120	0	1	6	0	0	220
15	29	2	134	6	0	2	0	0	173
Total	1,240	317	1,771	85	13	169	1	6	3,602

WEATHER AND RIVER DISCHARGE DATA

Headwater and tailwater elevations are given in feet above m.s.l. (mean sea level) and are plotted in figures 1 and 2.

Air temperatures were taken twice daily by maximum and minimum thermometer. A continuous record of water temperatures was taken by thermograph at the middle fish ladder. Daily records of weather and streamflows are shown in tables 9-14.

Maximum daily discharge of 349,900 c.f.s. (cubic feet per second) on June 18 was less than the 1964 record of 451,900 c.f.s. on June 17 (fig. 3).

Maximum water temperature of 66° F. occurred August 12, September 7, 10-12, and 14. In 1964, maximum water temperature of 64° F. occurred August 18, 22, and 23.

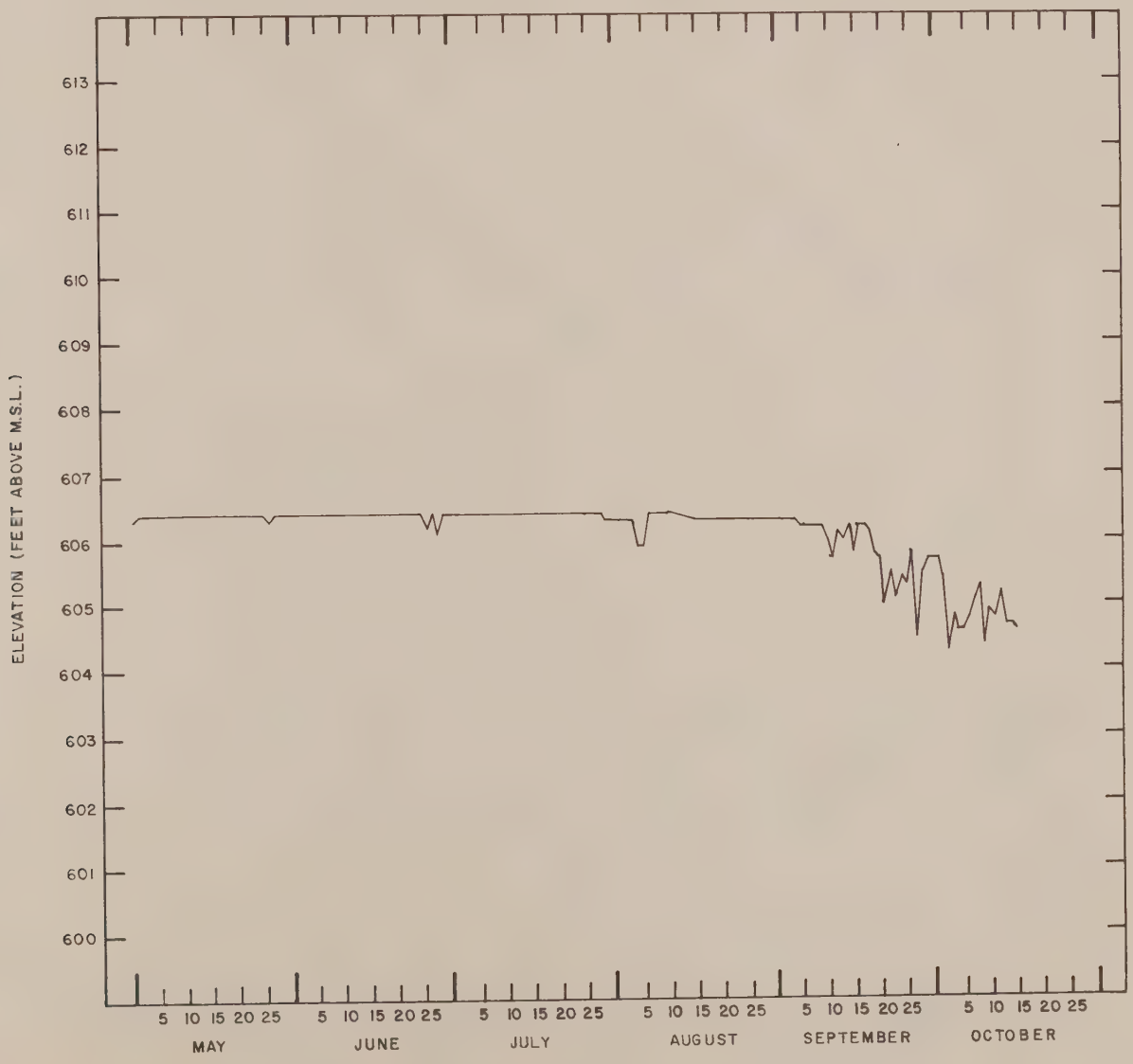

Figure 1.--Headwater elevations, Rock Island Dam, May 1 to October 15, 1965.

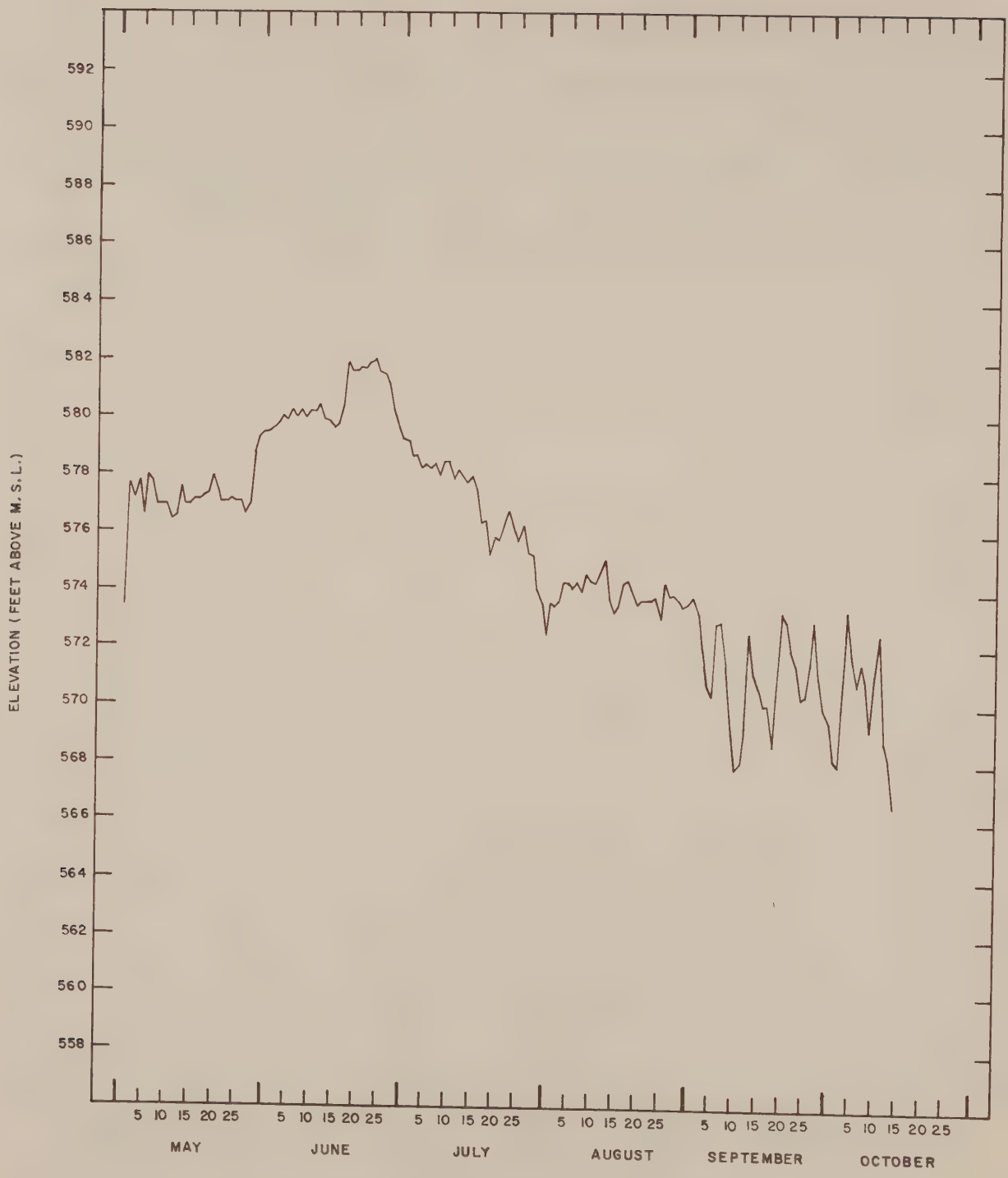

Figure 2.--Tailwater elevation, Rock Island Dam, May 1 to October 15, 1965.

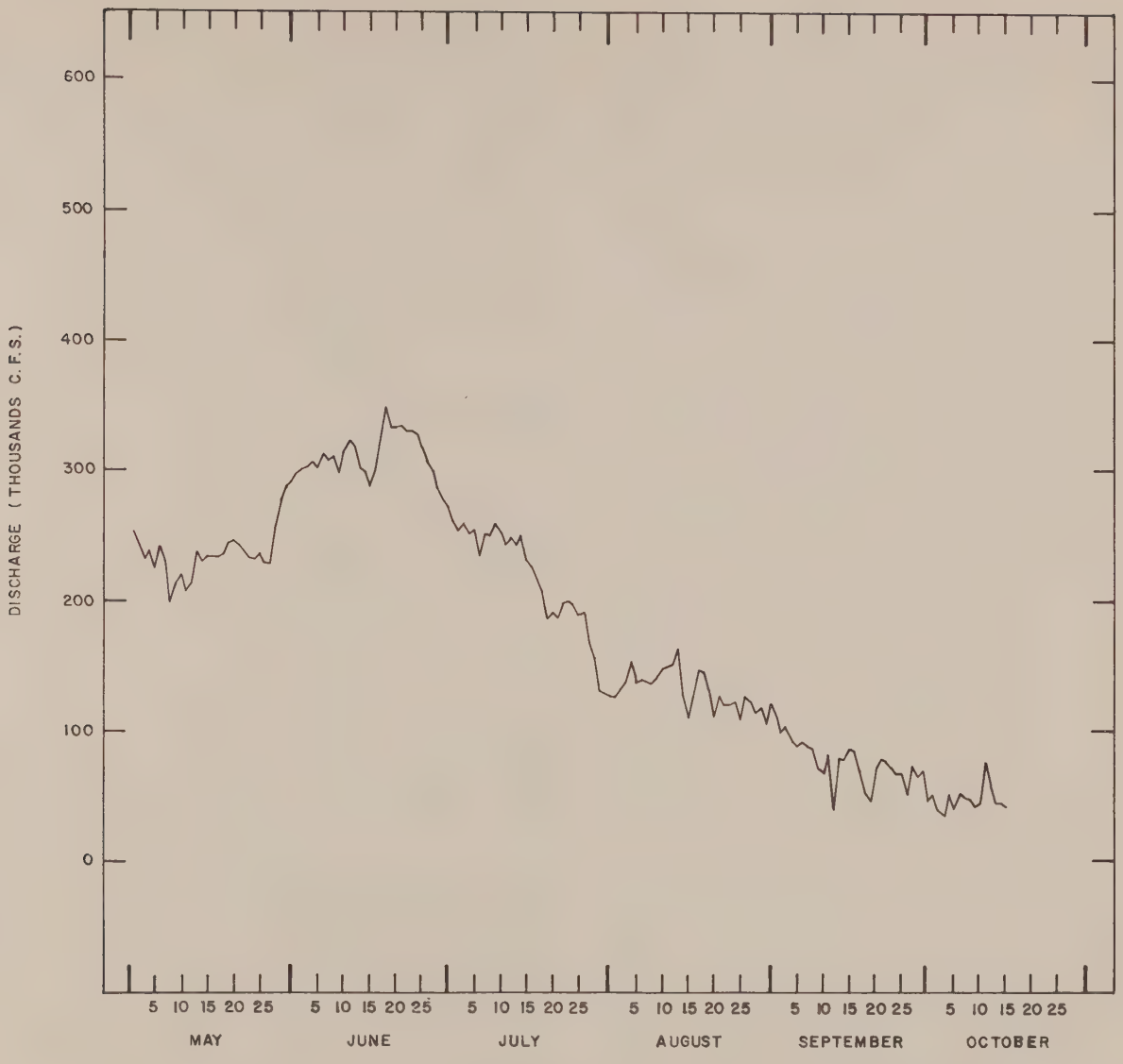

Figure 3.--Daily river discharge, Rock Island Dam, May 1 to October 15, 1965.

ACTIVITIES AND OBSERVATIONS

For 1 day, May 4, normal sequence of spillway gate operations was changed to determine riverflow patterns for future power generating units.

The waterflow was reduced in the right ladder from 11:00 to 11:30 a.m. and again from 1:30 to 3:40 p.m. on August 6 to repair a broken chain on an adjustable weir.

On August 30, attraction water was discontinued at left ladder entrance at 10 a.m. for removal of grass and weeds from the drop gate screen. Water was restored to the attraction system at left ladder entrance on August 31 at 2:30 p.m.

On September 1, the center ladder was partially dewatered from 12:45 to 2:30 p.m. to allow inspection by a diver of the diffusion gratings in the lower part of the ladder.

On September 16, from 10:25 to 11:50 a.m., attraction water at the left ladder entrance was discontinued to allow a diver to clean grass and weeds from a large screen in front of the drop gate.

On September 20, the center ladder was partially dewatered from 9 a.m. to 4 p.m. to repair a broken chain on an adjustable weir. An open submerged orifice was discovered at bottom of the counting station weir. Fish passing through this opening were not counted.

On September 21, the right ladder counting station was out of operation from 6 to 10 a.m. owing to high water in the pools above the counting weir. This condition resulted from grass and weeds plugging the pickets at the counting station.

On October 1, the center ladder was partially dewatered from 11 a.m. to 5 p.m. to repair a broken chain on an adjustable weir.

On October 5, the attraction water was discontinued at the center ladder from 10:20 to 11:40 a.m. to allow a diver to clean the screen in front of the entrance drop gate.

On October 15, attraction water at the left ladder was discontinued from 10:00 to 11:30 a.m. during removal of grass and weeds from the ladder entrance screen.

As part of an evaluation study of effects of Wanapum Dam reservoir encroachment on the ladders at Rock Island Dam, the Bureau of Commercial Fisheries trapped and tagged fish at the left bank ladder. Chinook were taken in a floating trap at the exit, and sockeye were trapped at the counting station inside the ladder. All fish taken were tagged with numbered Petersen disks and released about 1,000 ft. (feet) below the dam in equal amounts on each bank of the river. Trapping and tagging was performed intermittently from May 16 through June 9 for chinook and July 14 through August 4 for sockeye. During this period, 311 chinook and 679 sockeye were tagged and released. Numbers of tagged fish returning through the ladders were: chinook, 288; sockeye, 626. Twelve chinook tagged by fishery agencies in the lower river were observed passing over Rock Island Dam during the counting season.

During 1965, fish were observed with cuts or abrasions on their heads and bodies. Of the 85,107 salmon and steelhead seen passing over the counting boards, 3,801 fish (4.5 percent) had injuries (table 21). This was more than twice the percentage of injured fish observed in 1964. Because in both years the counters could see only the top and one side of each fish, the incidence of injury might have been greater than observed. Of the total number of injured fish observed in 1965, about 67, 22, and 11 percent were recorded in the left, middle, and right ladders, respectively. In 1964, these percentages were 56, 23, and 21. As in previous years, the greatest number of injuries was observed on the large chinook and sockeye. In the 2-wk. (week) period July 16-31, 26,691 sockeye were counted through the fishways and injuries were noted on about 8 percent. In 1964, during the same period, about 2 percent of the sockeye observed had injuries.

Throughout the counting season, State and Federal fishery personnel made frequent inspections of fishway operations at Rock Island Dam. Inspections were similar to those at other main stem dams where fishways were operated.

Table 21.--Injured fish observed at Rock Island, Dam, May 1 through October 15, 1965

Date	Species	Total fish counted	Injured fish observed			
			Left ladder	Middle ladder	Right ladder	Total
		Number	Number	Number	Number	Number
May 1-15	Chinook	546	0	8	0	8
	Chinook jacks	78	0	0	0	0
	Steelhead	195	0	0	0	0
May 16-31	Chinook	1,638	12	10	3	25
	Chinook jacks	604	0	0	0	0
	Steelhead	127	1	0	0	1
June 1-15	Chinook	826	15	4	4	23
	Chinook jacks	835	0	0	0	0
	Steelhead	21	0	0	0	0
June 16-30	Chinook	538	13	11	4	28
	Chinook jacks	326	0	0	0	0
	Sockeye	24	0	0	0	0
	Steelhead	10	0	0	0	0
July 1-15	Chinook	3,826	83	14	11	108
	Chinook jacks	1,171	4	0	2	6
	Sockeye	7,993	127	49	78	254
	Steelhead	33	0	0	0	0
July 16-31	Chinook	4,410	98	27	5	130
	Chinook jacks	1,677	1	0	0	1
	Sockeye	26,691	1,475	402	260	2,137
	Steelhead	256	0	0	0	0
Aug. 1-15	Chinook	4,737	114	37	2	153
	Chinook jacks	2,189	2	0	0	2
	Sockeye	6,515	432	246	35	713
	Steelhead	1,078	1	0	0	1
Aug. 16-31	Chinook	1,082	66	8	0	74
	Chinook jacks	2,168	5	0	0	5
	Sockeye	819	29	21	1	51
	Coho	7	0	0	0	0
	Steelhead	892	0	0	0	0
Sept. 1-15	Chinook	852	32	5	1	38
	Chinook jacks	4,252	7	0	0	7
	Sockeye	252	5	0	1	6
	Coho	8	0	0	0	0
	Steelhead	756	1	1	0	2
Sept. 16-30	Chinook	658	7	1	1	9
	Chinook jacks	2,982	8	1	1	10
	Sockeye	59	1	0	0	1
	Coho	124	2	0	1	3
	Steelhead	1,448	1	0	0	1
Oct. 1-15	Chinook	181	1	0	0	1
	Chinook jacks	831	1	1	1	3
	Sockeye	26	0	0	0	0
	Coho	119	0	0	0	0
	Steelhead	1,247	0	0	0	0
Total		85,107	2,544	846	411	3,801

SUMMARY

1. Total Rock Island Dam count of salmon and steelhead in 1965 was 85,107, about 30,000 less than in 1964.

2. The chinook count of 36,407 (jacks included) was 3,544 less than in 1964, more than two-thirds the peak year of 1957, and exceeded the 32-yr. average by about 18,300 fish. In 1965, 17,113 jacks were recorded, representing about 47 percent of the total chinook counted. In 1964, jacks represented about 36 percent of the chinook run.

3. The sockeye count of 42,379 in 1965 was less than the 1964 count by 27,032 fish and was less than the 32-yr. average of 52,159.

4. The coho count of 258 in 1965 was more than three times greater than the 32-yr. average of 80 fish and was about 35 percent of the peak year 1962 when 737 were counted.

5. The steelhead count of 6,063 in 1965 was 1,047 more than the 1964 count of 5,016 and 2,557 more than the 32-yr. average of 3,506.

6. In 1965, as in previous years, a greater percentage of salmon and steelhead used the left bank fish ladder than either of the other ladders.

7. Counting began May 1 and ended October 15. From May 1 through August 31, fish were counted 16 hr. each day; from September 1 through October 15, counting was reduced to 14 hr. each day, 6 a.m. to 8 p.m. to conform to the hours of available daylight.

8. In 1965, maximum number of salmonids counted in 1 day (3,340) occurred on July 16, as compared to 6,866 on July 27, 1964.

9. Season's total fish other than salmon and steelhead passing Rock Island Dam in 1965 was 115,045, composed of the following: sucker, 71,662; squawfish, 28,317, whitefish, 4,961; chub, 4,982; carp, 444; lamprey, 4,475; Dolly Varden and rainbow trout, 204.

10. Of the 85,107 salmon and steelhead examined, on the top and one side only as they passed over the counting boards, about 4.5 percent had injuries of some type either on the body or about the head. Most injuries were observed in July and August, and were more numerous among the larger chinook and sockeye.

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